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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/566,270	01/30/2006	Tsutomu Fukuda	285291US0PCT	1695
22850	7590	12/07/2010		
OBLON, SPIVAK, MCCLELLAND MAIER & NEUSTADT, L.L.P. 1940 DUKE STREET ALEXANDRIA, VA 22314			EXAMINER LI, JIN	
			ART UNIT 1732	PAPER NUMBER
			NOTIFICATION DATE 12/07/2010	DELIVERY MODE ELECTRONIC

**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

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# Office Action Summary

**Application No.**

10/566,270

**Applicant(s)**

FUKUDA ET AL.

**Examiner**

JUN LI

**Art Unit**

1732

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --  
**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 13 September 2010.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1, 4-6 and 12-22 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☐ Claim(s) 1, 4-6, 12-22 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- 1) ☐ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO/GS/US)  
Paper No(s)/Mail Date \_\_\_\_\_
- 4) ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date \_\_\_\_\_
- 5) ☐ Notice of Informal Patent Application
- 6) ☐ Other: \_\_\_\_\_

***Continued Examination Under 37 CFR 1.114***

A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on 09/13/2010 has been entered.

**DETAILED ACTION**

***Claim Rejections - 35 USC § 103***

The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

**1. Claim 1, 5-6, 12-16 and 18-22 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ono (US4483940) in view of Buscaglia et al (Journal of Materials Science 1996, 31: 5009-5016) and Fukuda et al (JP 2002-145659).**

Ono teaches a honeycomb carrier supporting a honeycomb catalyst for usage in internal combustion engines including treating exhaust gases (abstract, column 1 lines 24-26), wherein the honeycomb carrier can be any of the ceramic honeycomb carrier including aluminum titanate magnesia etc. ( i.e. aluminum magnesium titanate) (column 8 lines 39-45).

Regarding claim 1 and 21-22, Ono fails to specifically teach the component of the honeycomb carrier is a sintered product containing Mg, Al, Ti containing compound with an empirical formula  $\text{Mg}_x\text{Al}_{2(1-x)}\text{Ti}_{(1+x)}\text{O}_5$  ( $0 \leq x \leq 1$ ) and with addition of alkali feldspar represented by  $(\text{Na}_y\text{K}_{1-y})\text{AlSi}_3\text{O}_8$  (wherein  $0 \leq y \leq 1$ ).

Buscaglia teaches decomposition of aluminum titanate imposed a serious limitation to its practical applicant (page 5009 left column last para.) and such decomposition can be controlled by addition of MgO wherein the presence of magnesium introduces a considerable delay before the decomposition starts (page 5010 left column 2<sup>nd</sup> para.) Buscaglia discloses after 240 h annealing at 1100 °C, solid solution of aluminum magnesium titanate with magnesium mol amount from  $0.2 \leq x \leq 0.6$  showing only limited decomposition (7-15%). Buscaglia discloses there is no decomposition for  $x=0.1$  when heating at 1000 and 1200 °C (page 5010 left column 2<sup>nd</sup> para). Buscaglia also indicates that long term stability of aluminum magnesium titanate are important for practical applications (page 5010 left column last 2 para.) and that when Mg's mol percentage is 0.6, there is no decomposition for aluminum magnesium titanate after 250 hr treatment at temperature from 900-1175 °C (page 5013 Table 1). Buscaglia also indicates that decomposition ratio is depending on Mg's mol percentage and the solid solution aluminum magnesium titanate's annealing temperature (page 5013 first para., Table 1). It would have been obvious for one of ordinary skill in the art to adopt a proper Mg amount and annealing temperature for providing a long term stable aluminum magnesium titanate as suggested by Buscaglia.

It would have been obvious to one ordinary skill in the art at the time of invention filed to adopt a magnesium stabilized aluminum titanate compound as shown by Buscaglia (page 5010 left column 2<sup>nd</sup> para., last 2 para.) to practice the honeycomb carrier of Ono because Ono needs a specific aluminum magnesium titanate without specific describing one while Buscaglia provides an aluminum magnesium titanate with improved long term thermal stability.

Fukuda teaches using 1-15 parts by weight of alkali feldspar ( $(\text{Na}_x\text{K}_{1-x})\text{AlSi}_3\text{O}_8$ ,  $0 \leq x \leq 1$ ) to increase the mechanical strength and stability of aluminum titanate based sintered compact at 1400-1700 °C (abstract, machine translated detailed description page 3 paragraph [0012]). Fukuda further teaches that adding the alkali feldspar can control the grain growth of the sintered compact (machine translated detailed description page 3 paragraph [0014]), achieve a high mechanical, high stability at high temperature (i.e. high thermal stability), low thermal expansion and a stabilizing crystal structure wherein the obtained product can be used stably at high temperature about 1600 °C hundreds of times (abstract, machine translated detailed description page 5 paragraph [0025]).

It would have been obvious to one ordinary skill in the art at the time of invention filed to adopt the alkali feldspar of Fukuda to improve the aluminum titanate product because addition of alkali feldspar can improve the mechanical strength, corrosion resistance, thermal stability of the aluminum titanate as shown by Fukuda. Furthermore, to one of ordinary skill in the art it would have been obvious to combine the known elements such as magnesium stabilizer as shown by Buscaglia and alkali

feldspar as shown by Fukuda to improve the aluminum titanate for making a desired aluminum magnesium titanate as a honeycomb carrier support for intended uses including internal combustion engines such as automobiles for treating their exhaust gases and depriving them of air pollutants such as nitrogen oxides, carbon monoxides as indicated by Ono (column 1 lines 24-27) and Fukuda (machine translated detailed description page 5 paragraph [0025],[0026]) because magnesium can help improve thermal stability as suggested by Buscaglia and alkali feldspar can help improve mechanical strength, thermal stability as suggested by Fukuda and combining known elements for predictable results is well within the scope of one ordinary skill in the art.

Ono in view of Buscaglia and Fukuda is silent about the recited remaining  $\beta$  ratio difference, however, Ono in view of Buscaglia and Fukuda already teaches a substantially similar composition with desired long term thermal stability, and thus similar property such as the recited  $\beta$  remaining ratio difference in the instant claim is expected. Furthermore, both Buscaglia and Fukuda respectively teaches addition of magnesium and alkali feldspar can help increasing aluminum titanate long term thermal stability as discussed above, thus the recited difference of such ratio (thermal stability) between aluminum titanate and aluminum titanate magnesium in the instant claims are thus expected results associated with addition of such elements.

Regarding claims 5 and 6, Ono teaches honeycomb catalyst is extensively used in internal combustion engines such as of automobiles for treating their exhaust gases and depriving them of air pollutants such as carbon monoxide, hydrocarbons and nitrogen oxides (col. 1 lines 24-27) wherein the base metal can be alkali metals and

alkaline earth metals, rare earth metal and noble metals (col. 5 lines 53-58). Ono also discloses using such catalyst (Example 16, column 13 lines 61-62, Example 18, column 14 line 44) to remove nitrogen oxides  $\text{NO}_x$  from combustion gas burned in a cylindrical combustion apparatus where an air-methane mixed gas containing 3% methane was introduced into and burned (column 17 lines 14-22). The corresponding catalyst activity for removing NO is shown in Table 6 (column 17-18).

Furthermore, the recited limitations in claim 6 do not render the claimed aluminum magnesium titanate patentable.

Regarding claim 12 -13 and 16, the recited  $\gamma$  and weight range of the alkali feldspar and the recited temperature firing temperature discussed above overlaps with the prior arts, a prima facie case of obviousness exists (See § MPEP 2144.05 [R-5] I).

Regarding claim 14-15, Fukuda further teaches the raw mixture containing  $\text{TiO}_2$  and  $\text{Al}_2\text{O}_3$  and alkali feldspar can be grinded to suitable particle diameter, such as to about 1  $\mu\text{m}$  or less. Fukuda also suggests that there is no particular need about the grade of grinding of a raw material ([0015], [0016]).

It would have been obvious for one of ordinary skill in the art at the time of invention filed to adopt such size of raw mixture for obtaining a desired product as suggested by Fukuda. Thus the recited size is just an obvious modification over the prior art. Furthermore, MPEP points out changes in sizes over prior art cannot make the invention patentable distinct (See § MPEP 2144.04 [R-6] IV).

Regarding claim 18 -20, Fukuda further teaches the sintered compact with addition of alkali feldspar has outstanding erosion proof and corrosion resistance [0025]

last 5 lines). It is to be noted that similar composition and similar method of for making a recited honeycomb carrier composition as in the instant applications have been fully disclosed in the applied prior arts, thus similar corrosion resistance associated with addition of alkali feldspar is expected from prior arts' teachings.

**2. Claim 4 and 17 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ono (US4483940) in view of Buscaglia et al (Journal of Materials Science 1996, 31: 5009-5016) and Fukuda et al (JP 2002-145659) as applied to 1, 5-6, 12-16, 18-22, and further in view of Noda (US2001/0056034).**

Regarding claim 4, Ono in view of Buscaglia and Fukuda has been described as above.

Ono further teaches that the cell density of the honeycomb carrier is 300cells/square inch (equals to 46.15 cells/cm<sup>2</sup>), reading to the recited limitation of cell density within 15-124cells/ cm<sup>2</sup>). Ono also teaches that the thermal expansion of the aluminum titanate magnesium is less than  $0.3 \times 10^{-6} \text{ K}^{-1}$ , which overlaps with the thermal expansion coefficient of the instant claim. MPEP clearly states that in the case where the claimed ranges "overlap or lie inside ranges disclosed by the prior art" a prima facie case of obviousness exists. See MPEP §2144.05 [R5]. It is also noted that the thermal expansion coefficient is a determined physical property with a compound from chosen materials. Since the honeycomb carrier material is an obvious modification over prior art, thus the associated thermal expansion coefficient is also expected.



Ono in view of Buscaglia and Fukuda fails to expressly teach that the honeycomb carrier has a wall thickness from 0.05-0.6mm, and the porosity of the partition wall is 20-50%.

Noda teaches that the honeycomb carrier made from aluminum titanate with addition of Mg can have a porosity of 5-50%, preferably 10-40% (page 2 paragraph [0014]), which reads onto the recited limitation of porosity of 20-50% in the instant claim 4. Noda indicates that probably porosity is needed to maintain probable honeycomb carrier strength and suppresses the diffusion of alkali metal or alkaline earth metal catalyst into the carrier ((page 2 paragraph [0014]). Noda further teaches that a wall thickness of 0.05-0.1mm with a cell density 62-139.5 cells/cm<sup>2</sup>(page 2 paragraph [0023]), reading into the recited limitation of the partition wall thickness of 0.05-0.6mm and cell density 15-124 cells/cm<sup>2</sup> in the instant claims. Noda also indicates that probable porosity and cell density can ensure good cell structure of honeycomb carrier with good bending strength and thermal expansion coefficient (less than  $3.0 \times 10^{-6} \text{ K}^{-1}$ ) for effectively purifying NO<sub>x</sub> from exhaust gas (page 3 table 1, paragraph [0028]).

It would have been obvious to one ordinary skill in the art at the time of the invention filed to adopt the porosity and cell density of Noda to improve the honeycomb carrier structure of the combined references. One ordinary skill in the art would have been motivated to do so because probable porosity and cell density can ensure good cell structure of honeycomb carrier with good bending strength and thermal expansion coefficient to effectively purify NO<sub>x</sub> from exhaust gas (page 3 table 1, paragraph [0028]) and probable porosity can well suppresses alkali metal or alkaline earth metal catalyst

into the carrier to ensure the durability of the catalyst (page 2 paragraph [0014] and page 3 paragraph [0029] lines 5-12).

Regarding claim 17, Ono in view of Buscaglia and Fukuda fails to expressly teach the catalyst comprising potassium.

Ono further teaches alkali metals can be used as honeycomb carrier supported catalyst component (column 5 lines 53-58) and Noda further teaches alkali metals including K can be used as catalyst (page 1 [0004]).

One of ordinary will have been obvious to use potassium as the catalyst component for purifying exhaust gas as shown by Noda because potassium is one of well known alkali metal catalyst component used in the art as shown by Noda and adopting known technique for improving efficiency of similar method/product is well within the scope of one ordinary skill in the art.

### ***Response to Amendment***

The affidavit under 37 CFR 1.132 filed on 09/13/2010 is insufficient to overcome the rejections as set forth in the last Office action because: the supplied evidence is not in commensurate with the scope of claims. It is noted that the instant claims directed to remaining  $\beta$  ratio for heating at 1000 °C for 80-100 hours while the supplied data is directed to heating at 1100 °C for 500 hours. It is commonly known in the art that the remaining ratio or decomposition ratio is strongly dependent on the heating temperature and Mg amount as shown by Buscaglia (page 5010 left column, page 5012 right column-page 5013 left column). Buscaglia discloses there is no decomposition for

magnesium aluminum titanate with  $x=0.1$  when heating at 1000 and 1200 °C (page 5010 left column 2nd para). In order for the office to consider the unexpected/superior results, applicant is reminded to compare their data against the applied prior arts' data.

### ***Response to Arguments***

Applicant's arguments filed on 09/13/2010 have been fully considered but they are not persuasive. In response to applicant's arguments about Buscaglia only teaching  $\text{Mg}_x\text{Al}_{2(1-x)}\text{Ti}_{(1+x)}\text{O}_5$  ( $0 \leq x \leq 1$ ) not decomposition at  $x=0.6$ , it is noted that such decomposition is carried at 900-1175 °C for 250 hours (Table 1, page 5012 right column) while Buscaglia expressly disclosed that addition of magnesium can delay aluminum titanate decomposition (page 5010 left column) and the decomposition ratio is strongly depending on the Mg amount and heating temperature (page 5012 right column, page 5013 left column). Buscaglia discloses there is no decomposition for magnesium aluminum titanate with  $x=0.1$  when heating at 1000 and 1200 °C (page 5010 left column 2nd para). Therefore, with addition of Mg, aluminum titanate will have higher thermal stability, accordingly lower decomposition ratio. It would have been obvious for one of ordinary skill in the art to adopt a proper Mg amount to obtain a magnesium aluminum titanate with long term thermal stability because such thermal stability is important for its practical applications as suggested by Buscaglia (page 5010 left column). As for Ono and Buscaglia not disclosing adding alkali feldspar, Fukuda has been applied to remedy such deficiency because addition of alkali feldspar can help improving the mechanical strength, corrosion resistance, thermal stability of the

aluminum titanate. Therefore, the combination of the references clearly envisioned the claimed aluminum magnesium titanate with the expected properties. As for the supplied affidavit, it is noted that such data is not in commensurate with the scope of the claims. Furthermore, the applied references already teach a substantially similar composition, thus substantially similar properties are expected. It is applicant's burden to show otherwise, i.e., there is no data/evidence to demonstrate the prior art disclosed magnesium aluminum titanate will not possess such long term thermal stability.

### ***Conclusion***

No claims are allowed.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to JUN LI whose telephone number is (571)270-5858. The examiner can normally be reached on Monday-Friday, 9:00am-5:30 pm EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Curtis Mayes can be reached on 571-272-1234. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/JUN LI/  
Examiner, Art Unit 1732  
12/01/2010

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